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# Quantum3D®
# Sentiris®



COTS, Open-Architecture Embedded Graphics Subsystem

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# Quantum3D® Sentiris®

## NVIDIA QUADRO4 BASED PCI MEZZANINE CARD

### Sentiris™ PMC 4110

The Sentiris™ PMC 4110 continues as the industry-leading advanced COTS graphics subsystem developed for performance-sensitive embedded visual computing applications. Created by Quantum3D™, the premier supplier of NVIDIA-based technologies for the embedded visual computing market, Sentiris PMC 4110 is an IEEE 1386.1 compliant PCI Mezzanine Card that brings the power of the NVIDIA® Quadro™4 Embedded Graphics Processing Unit (GPU) to realtime military and commercial embedded visual computing applications. Sentiris combines high-performance, high-resolution multi-channel 2D and 3D graphics and advanced video input/output with low-power consumption and extended or mil-spec environmental capabilities to meet the demanding requirements of realtime visualization for such diverse applications as SAAB Avionics digital map and situational awareness for helicopter pilots, Titan's heads-down display for high-speed, fully-amphibious assault hovercraft navigation, L-3's Landing Signal Officer (LSO) workstation for aircraft recovery on U.S. Navy aircraft carriers, and both the airborne radar units and ground control stations for General Atomics' Predator UAV.

### Highest Performance Graphics/Video PMC Available

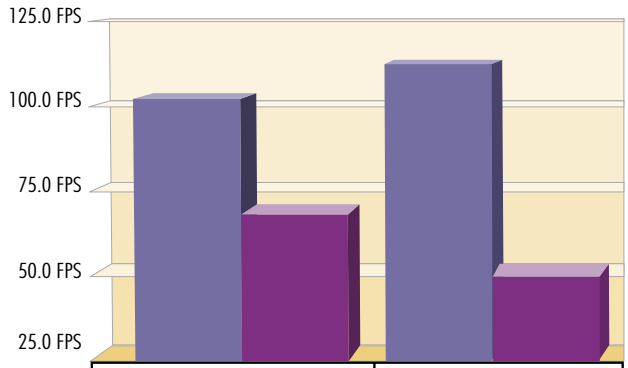
Sentiris PMC 4110 harnesses the power of the NVIDIA Quadro4 GPU acceleration to provide unprecedented 2D and 3D graphics performance for mission critical applications. With a 128-bit interface to 64MB of DDR memory, Sentiris PMC 4110 has a dedicated graphics bandwidth of 7.0 GB/sec. This capability enables Sentiris to deliver up to 400 megapixels per second (trilinear) pixel fill rate, 5.4M independent, texture mapped triangles per second (trilinear) and 4.8M 3D AA lines per second (all performance figures based on Real World Benchmarks 2.3.3) when deployed with Single Board Computers (SBCs) that support 66 MHz PCI-bus interconnects. This is between five and ten times the performance of the closest PMC competitors based on the ATI mobile GPUs..

On typical fill-rate intensive OpenGL applications, such as synthetic vision or embedded training, the Quantum3D Sentiris exhibits between 50% and 130% higher performance over competitive solutions, including the SBS Technologies G2 (Chart 1).

On typical anti-aliased line intensive OpenGL applications, such as avionics, vetronics and C4ISR applications, the Quantum3D Sentiris exhibits up to a 630% higher performance over competitive solutions, including the GE Fanuc G2 (Chart 2)

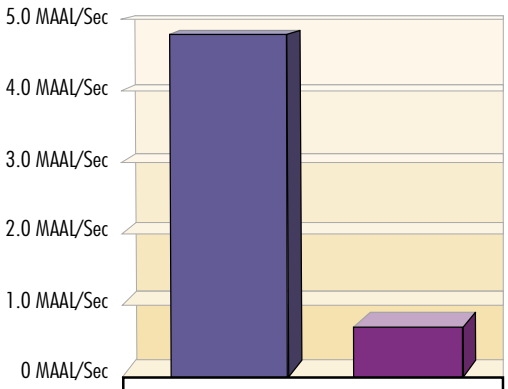
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**Chart 1: Quantum3D Sentiris PMC vs. GE Fanuc G2 PMC**
RWB 2.3.3 GVB and GVF Performance with 32-bit Rendering, Trilinear Filtering with 1SPS FSAA Enabled




| | RWB 2.3.3 GVB (Embedded Training) | RWB 2.3.3 GVF (Synthetic Vision) |
|---|---|---|
| Quantum3D Sentiris PMC | **102.7 FPS** | **112.9 FPS** |
| GE Fanuc G2 PMC | **68.7 FPS** | **49.7 FPS** |

**Chart 2: Quantum3D Sentiris PMC vs. GE Fanuc G2 PMC**
RWB 2.3.3 GVT Performance with 32-bit Rendering, Trilinear Filtering, 1SPS FSAA and OpenGL AA Line Smoothing Enabled




| | RWB 2.3.3 GVT SLR (Anti-Aliased Line Rate) |
|---|---|
| Quantum3D Sentiris PMC | **4.8 MAAL/Sec** |
| GE Fanuc G2 PMC | **0.7 MAAL/Sec** |






# FOR EMBEDDED VISUAL COMPUTING APPLICATIONS

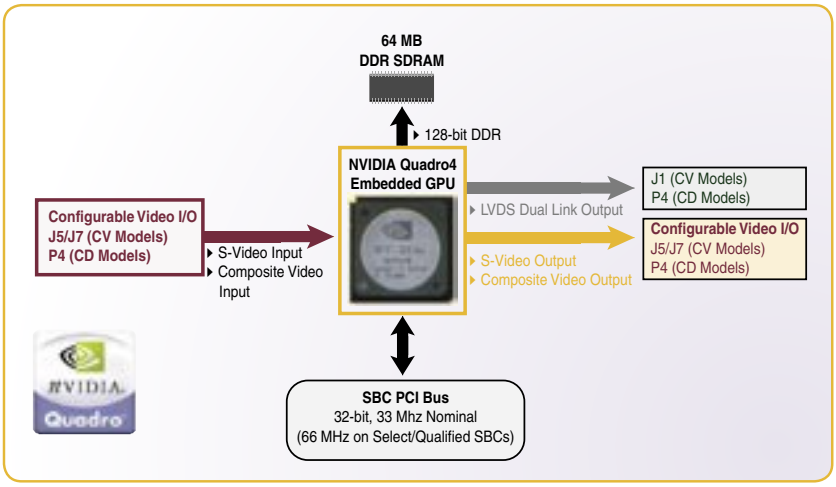
## Unmatched Image Quality



The Quadro4-equipped Sentiris PMC 4110 provides industry-leading image quality - crucial for target recognition and improved situational awareness – and offers 16- or 32-bit RGBA and Z with both full scene (up to 4 sub-samples per pixel) and Quadro4 edge anti-aliasing, combined with both trilinear and anisotropic texture filtering to provide the best possible image quality for both 2D and 3D graphics operations. Sentiris PMC 4110 also supports key Quadro4 workstation level features such as render to texture and vertex buffer objects, enabling rapid migration of new capabilities out from the lab into the field.

## Flexible Graphics and Video I/O Capabilities

For integration applications where multiple channel outputs are essential, Sentiris PMC 4110 supports implementation of 2-channel display systems per PMC. Dual, independent analog and digital RGB (LVDS) output support with analog resolutions to 2048 x 1536 and digital resolutions to 1600 x 1200, means Sentiris PMC 4110 is ready for next generation display applications. For output to legacy vehicle displays and flat panels, Sentiris PMC 4110 also supports popular video output formats including NTSC, PAL, RS-170, RS-170A and S-Video. For sensor, television or other video input requirements, Sentiris PMC 4110 supports video input for the same composite and S-Video formats, which may be mapped to any output- either directly into the frame buffer or via video texturing. Along with expert design support for customized solutions, Quantum3D technical staff has decades of man years experience in advanced graphics and video processing for implementing customized timings and video formats.




## Designed for Technology Insertion and Open Architecture Applications

Compliant with the IEEE 1386.1 PCI Mezzanine Card standard, the Sentiris PMC 4110 is compatible with VME, CompactPCI, PC-104+ and other embedded form factor single board computers equipped with either 33 MHz or 66 MHz PMC slots (3.3 or 5V), which makes Sentiris PMC 4110 perfect for P3I applications where technology insertion or preservation of the installed base infrastructure is important. Sentiris PMC 4110 supports Microsoft® Windows®2000, WindowsXP, and WindowsXP Embedded bringing OpenGL® 1.4 (or Earlier) and DirectX® 9.0 to Intel® IA32™ Architecture Systems. Sentiris also supports OpenGL® 1.2 under Linux and popular Real Time Operating Systems, including WindRiver® VxWorks® on both IA32 and PowerPC™ architecture systems. With this level of hardware and software compatibility, new applications, as well as existing applications can take advantage of Sentiris' performance and image quality without requiring a major software effort.

## Designed for Extended and Mil-Spec Environments

Sentiris takes advantage of the advanced power management technology to simultaneously deliver high performance and low power consumption and heat dissipation. With Sentiris, typical power consumption is less than nine watts in most applications. Sentiris PMC 4110 is available in both convection and conduction-cooled models ). Both models are designed to meet the shock, vibration and temperature requirements of MIL-Std 810F and the EMI/EMC requirements of MIL-Std-461E, so Sentiris is well suited for harsh environment field deployments, wherever the challenge leads.

## Sentiris Development Systems and SBC/PMC Combinations

For rapid development and testing applications, Quantum3D can offer either Intel or PowerPC Architecture Development Systems. With PCI/ATX, VME and CPCI form factors, Sentiris Development Systems are the perfect way to jumpstart an advanced embedded graphics development effort for Windows, Linux or RTOS based environments. For complete details on Sentiris Development Systems, including details on available RTOS board support packages, pricing and delivery, or for information on SBC/PMC combinations for optimum performance and ease-of-integration, please contact Quantum3D or your local Quantum3D distributor.



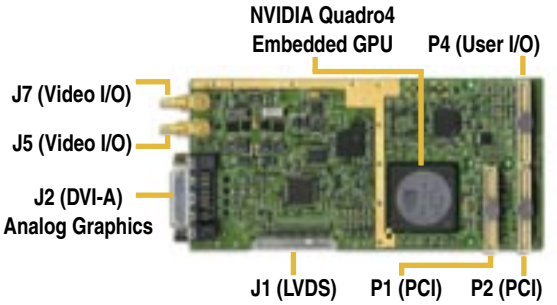
Sentiris™ PMC Development System

# SPECIFICATIONS

- **IEEE P1381.1 Compliant PCI Mezzanine Card with Convective and Conductively Cooled Models**
  - Convection Cooled PMC Per IEEE-P1381.1 / Draft 2.1: Model Sentiris PMC 4110 CV10
  - Conduction Cooled PMC Per VITA 20-199x Draft: Model Sentiris PMC 4110 CD13
- **PCI Bus Support**
  - 32-bit PCI, 33 MHz and 66 MHz Capable
  - Both 3.3V and 5V PCI Signal Compatible
- **NVIDIA Quadro4 Embedded GPU (NV17GLM) with 256-bit Internal Architecture, Dual Graphics Pipeline and 220 MHz Operation**
- **128-bit Wide Interface to 64MB DDR SDRAM Frame Buffer/Texture Memory with 220 MHz Operation**
  - Approx. 7.0 GB/Sec Dedicated Graphics Bandwidth
  - Pixel Fill Rate Performance Up to 400 MP/Sec with Trilinear Filtering Enabled (RWB 2.3.3 GFILL)
- **On-Board Transformation & Lighting Engine**
  - Up to 5.4M Independent Trilinear Textured Triangles/Sec (based on RWB 2.3.3 GVT on PCI-66 MHz Bus)
- **Acceleration for Enhanced AA Point, Line and Polygon Performance**
  - Up to 4.8M Independent, Z-buffered, Lit Anti-Aliased Lines/Sec (based on RWB 2.3.3 GVT on PCI-66 MHz Bus)
- **Support for Dual, Independent/Clone Channel Output with Two Simultaneously Active Graphics or Video Outputs (See Graphics/Video I/O Table)**
  - LVDS (Flat Panel, OpenLVDS) Digital Output
  - Composite or S-Video
- **Flexible Video Input: NTSC, PAL, RS-170, RS-170A or S-Video (See Graphics/Video I/O Table)**
- **Reduced Power Consumption and Heat Dissipation Technology**
  - Total Power Consumption at Nominal 2D/3D/Video Load: less than 9 Watts Typical
  - Reduced Power Consumption Possible with Clock De-rating
- **Software and Platform Support**
  - Microsoft® Windows2000™, WindowsXP®, and WindowsXP Embedded with OpenGL® 1.4 and DirectX 9.0 on Intel® IA32™ Platforms
  - WindRiver® VxWorks™ Version 5.4 and 5.5 with OpenGL® 1.2 on Intel IA32 and PowerPC™ Platforms
  - RedHat® Linux® V7.3 (and Higher) on Intel IA32 Platforms
  - Quantum3D Diagnostics, Utilities and BIT for Deployed IA32 and PowerPC Environments
- **Environmental Compatibility**
  - FCC Part 15 Level A and CE on All Models
  - Mil-Std-461E on Sentiris PMC 4110 CD13
  - Mil-Std-810F on Sentiris PMC 4110 CD13
- **Safety Certification:** UL, ETL or Equivalent and CE on All Models

| ENVIRONMENTAL SPECIFICATIONS | | | | |
|---|---|---|---|---|
| **Characteristic** | **Sentiris 4110 CV10 PMC (Convection Cooled)** | | **Sentiris 4110 CD13 PMC (Conduction Cooled)** | |
| **Board Temperature Range** | **OP** 0° to + 55° C | **Non-OP** -40° to +100° C | **OP** - 40° to + 85° C[i] | **Non-OP** -40° to +100° C |
| **Operating Humidity** | 0 - 95%, Non-condensing | | 0 - 100% Non-condensing | |
| **Sine Vibration[ii]** | 8 g peak[iii] , 15 - 2k Hz | | 10 g peak[iv] , 15 - 2k Hz | |
| **Random Vibration[v]** | 0.05 $g^2$ / Hz, 15 - 2k Hz | | 0.1$g^2$ / Hz, 15 - 2k Hz | |
| **Shock[vi]** | 30 g peak Half-sine 9 ms | | 40 g peak Half-sine 11 ms | |
| **Conformal Coating** | No | | Yes | |
| **Atmospheric Pressure** | Sea Level to 15k ft. | | Sea Level to 40k ft. | |
| **Decompres-** | N/A | | 15k ft. to 40k ft. in 15 seconds | |

Notes:
i At thermal interface
ii Sweep duration 10 minutes each, independent axis test
iii Displacement limited to 0.10 inches below 40Hz
iv Displacement limited to 0.40 inches below 20Hz
v Duration 30 minutes each axis, independent axis test
vi Three impacts of two directions on each axis




| SENTIRIS™ PMC 4110 MODELS / SKUs | | ACTIVE I/Os: ANY 2 MAY BE ACTIVE SIMULTANEOUSLY | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | DVI-A Analog RGB Output: 2048x1536 Max. Resolution with 16-bpp (5/6/5) Output | LVDS Output: 1600 x1200 Max. Resolution with 18-bpp (6/6/6) Output | RS-170/ RS-170A, NTSC/PAL Composite | | S-Video Output | | S-Video Input | |
| | | | | OUT | IN | CHR | LUM | CHR | LUM |
| CV (Convection Cooled SKUs: CV10) | Composite Video I/O SKU CV10 | Via J2: PanelLink™ DVI-A Pins | Via J1: DFP Board Edge Connector | Via J7 | Via J5 | | | | |
| | S-Video or Composite Input SKU CV10 | | | | Via J5 | | | Via J5 | Via J7 |
| | S-Video or Composite Output SKU CV10 | | | Via J7 | | Via J5 | Via J7 | | |
| | Video Capabilities Enabled Via Software Selection of P4 Ports CV10 | Via P4 Connector Resolutions Subject to Limitations of SBC. Max. Res. may be available on Select/Qualified SBCs only. | | Via P4 Connector Composite In/Out, S-Video Input, or S-Video Output Software Selectable | | | | | |
| CD (Conduction Cooled SKU: CD13) | Video Capabilities Enabled Via Software Selection of P4 Ports | | | | | | | | |

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